PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED DISTRIBUTION, NO. 43: OLIVE FRUIT FLY

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Pest

OLIVE FRUIT FLY
Dacus oleae (Gmelin)

Order: Family

Diptera: Tephritidae

Economic Importance

Destruction of olives by *D. oleae* in the Mediterranean region precludes the possibility of the development of a ripe olive industry. Several overlapping generations infest olives from early summer to harvest (Weems 1966). Losses in Libya were estimated at 50 percent of the crop (Sharaf 1980) while those in Egypt were estimated at 30 percent (Donia, El-Sawaf, and Abou-Ghadir 1971).

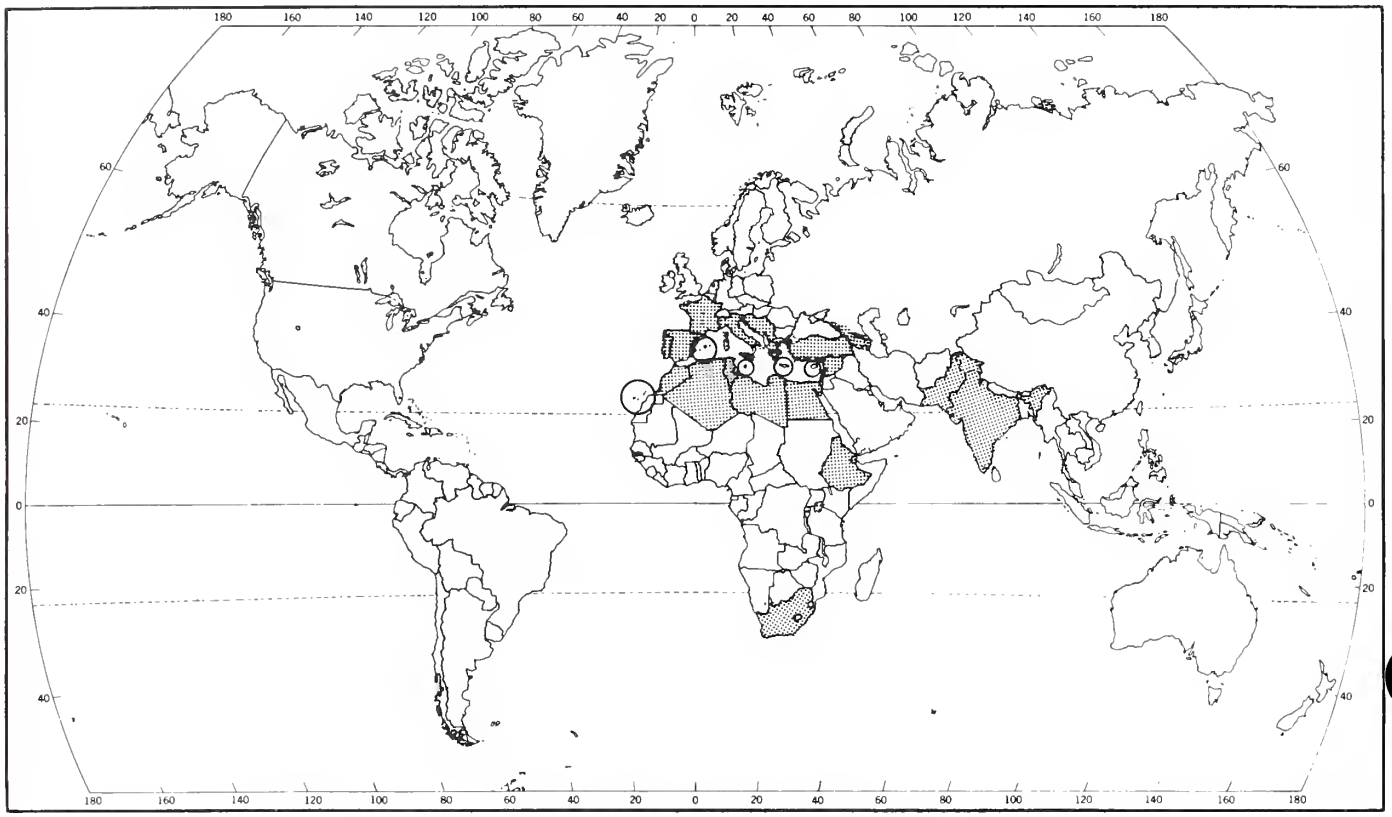
The larvae, which feed on olive pulp, are the stage of greatest economic importance. Their feeding reduces oil quantity (an estimated 20-30 percent in infested olives in Crete), as well as oil quality (Neuenschwander and Michelakis 1978). Damage decreases the price for infested fruits used for pickling, and increases the acidity of the oil up to 20 percent (Sharaf 1980).

Hosts

Larvae of *D. oleae* feed only in the fruit of the olive. They infest various species of the cultivated and wild fruits at any stage of growth, green to ripe. Susceptibility to infestation varies among different olive varieties according to the degree of ripening of the fruits. The recorded host list includes *Linociera foveolata*, *Olea africana* (goldleaf olive, wild olive), *O. capensis* (black ironwood), *O. europaea* (olive), and *O. woodiana* (forest olive) (Donia, El-Sawaf, and Abou-Ghadir 1971, Paddock 1976, Phillips 1946).

General Distribution

This pest occurs in EUROPE: Balearic Islands, France (including Corsica), Greece (including Crete), India, Italy (including Sardinia and Sicily), Malta, Portugal, Spain, and Yugoslavia; in ASIA: Cyprus, Israel, Lebanon, Pakistan, Syria, and Turkey; the Soviet Union (Caucasus); and in AFRICA: Algeria, Canary Islands, Egypt, Ethiopia, Libya, Morocco, South Africa, and Tunisia (Commonwealth Institute of Entomology 1957, Weems 1966). It is probably indigenous to South Africa (Phillips 1946).



Dacus oleae distribution map prepared by Non-Regional Administrative Operations Office and Biological Assessment Support Staff, PPQ, APHIS, USDA

Characters

ADULTS (Fig. 1) - Body length 4-5 mm, wing length 3-4 mm; head yellowish to light brown, eyes black; ocellar and postocellar bristles absent; thorax black with fine silvery pubescence dorsally, forming 3 narrow parallel black stripes; humeri and area surrounding wing base yellow; acrostichal, dorsocentral, presutural, katepisternal, and anterior supra-alar bristles absent; scutellum mostly yellow, base blackish medially; only 1 apical pair of scutellar bristles; abdomen black with scattered gray pubescence, basal segments with pale transverse bands, center of apical segments with irregular parallel bar or blotch of reddish brown; wings mostly transparent, with dark apical spot at tip of R4-t; basal cubital cell with elongate extension (Paddock 1976, Weems 1966).

(Fig. 1)

Dacus oleae female adult, dorsal view (From Paddock 1976).

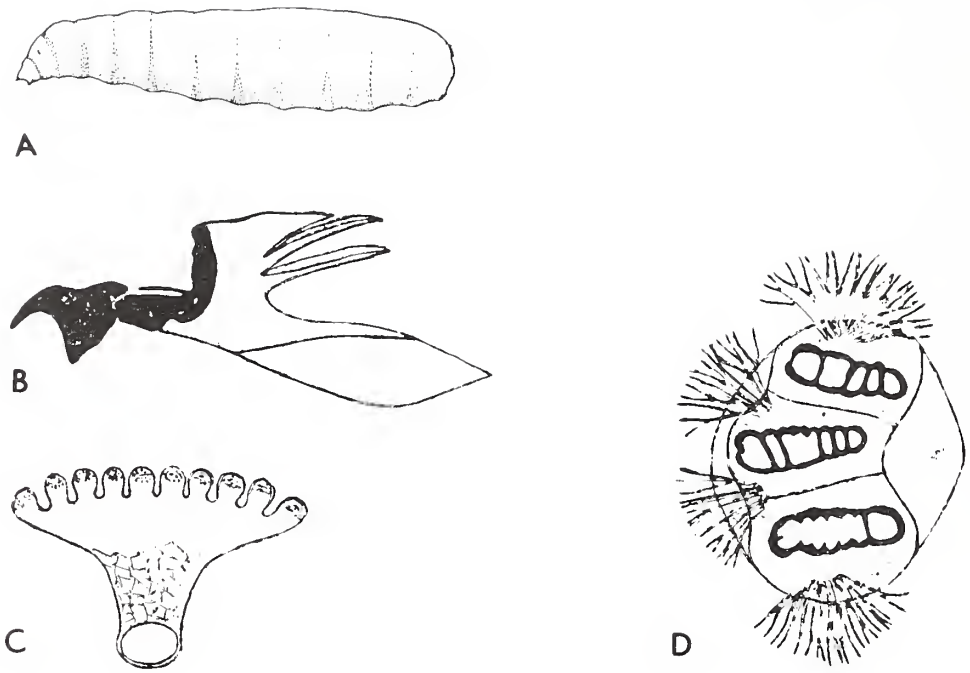
Male third abdominal tergite with two lateral rows of conspicuous cilia, abdomen rounded posteriorly, genitalia easily distinguished ventrally. Female with short but conspicuous ovipositor sheath apically; ovipositor flattened dorsoventrally (El-Sawaf, Donia, and Abou-Ghadir 1972).

EGGS - White, about 1 mm long, elliptical (Paddock 1976).

LARVAE (Fig. 2A) - Yellowish white, elongate, cylindrical, tapering to pointed head; 11 segmented (Paddock 1976). Length 5-6 mm, diameter 1.5 mm. Head with narrow band of tiny spinules; antennal papilla two segmented; maxillary papilla one segmented; 10-12 oral ridges. Cephalo-pharyngeal skeleton (Fig. 2B) small, about as high as long, anterior margin of dorsal cornua even, not projecting anteriorly. First segment of thorax with narrow band of tiny spinules; anterior spiracles (Fig. 2C) small, fan-shaped, with about 10 papillae; creeping welts with spinules close together in long, almost straight lines; posterior spiracles (Fig. 2D) small, spiracular openings oval, about four times as long as wide, nearly parallel, with several crossbars; spiracular hairs, each with 6-10 trunks giving rise to 13-25 branches (Phillips 1946).

PUPARIUM - Pale brown, cylindrical, 11 segmented, 4 mm long, about half as wide (Paddock 1976).

(Fig. 2)



Dacus oleae larva: A. Lateral view (From Paddock 1976). B. Cephalo-pharyngeal skeleton. C. Anterior spiracle, dorsal view. D. Posterior spiracles, dorsal view (From Phillips 1946).

Characteristic Damage

Infested olive fruits fall prematurely. Damaged fruits are mottled with hollowed interiors inhabited by larvae. Early damage shows as slightly sunken, brown necrotic spots (Fig. 3). Fungus develops around the oviposition punctures. Damage is also increased by the feeding of the olive fruit midge (Lasioptera berlesiana Paoli) which leads to additional premature drop of infested fruits (Hill 1983, Sharaf 1980).

Detection Notes

Movement of olive fruits could introduce D. oleae into a new area. Fresh olive fruits intended for consumption are prohibited entry from infested countries into the United States under Title 7, Part 319.56 of the Code of Federal Regulations.

The total number of Dacus oleae larval interceptions at U.S. ports of entry was 1,073 for the past 12 years. This pest is most frequently intercepted in Olea europaea in baggage from Greece and Italy. It has also been intercepted a few times in mail, stores, and general cargo. There were interceptions of D. oleae in Olea europaea from Iran, Iraq, and Jordan, countries which are not cited in the literature and may represent transshipments from other areas.

(Fig. 3)

Dacus oleae: Larval damage to olives (From Paddock 1976).

Olive fruit fly may be detected by the following means (Paddock 1976).

1. Look for fruit with oviposition punctures.

2. Examine prematurely dropped fruit for larvae, their tunnels, and grayish-white areas under the skin.

3. Watch for adult flies on olive foliage from midsummer to fall. They are attracted to honeydew produced by other insects.

4. Trap adults in or near host trees from summer to fall. Because this pest is monophagous, trapping should occur in vicinity of olive trees. Trapping might be more effective in the latter portion of the trapping season as host fruit ripens.

5. Submit in alcohol for identification any suspect larvae, pupae, or adults.

Biology

In Yugoslavia, under summer conditions, D. oleae mates 6-10 days after emergence. A female oviposits 10-12 eggs daily, 200-250 in a lifetime, usually no more than 1 egg per olive fruit. The egg, larval, and pupal stages last 2-4, 10-14, and about 10 days, respectively. Early generation larvae pupate mostly in fruits; the last generation larvae pupate in soil or elsewhere (Christenson and Foote 1960).

In Libya, this species is found throughout the year. The overwintering adults tend to congregate in locations which provide shelter and food, mostly under fallen leaves. As spring approaches and olive trees begin to flower, the activity of the overwintering adults increases, their chances of survival enhanced by the juices and nectars of flowering plants, and homopteran honeydew (Sharaf 1980). In a study in Greece, adults survived 55 days with an hour of feeding each day at 7° C, and 25 days without food at 3-7° C or 7 days at 24° C (Manicas 1974).

In summer, the adults become active during daytime at optimum temperatures of 23-29° C. When olive fruits reach the suitable size (pea-size) for egg deposition, females puncture the olive fruits and lay their eggs under the skin. The female often makes numerous punctures without ovipositing; these are sterile or feeding punctures from which she imbibes the exuding juices. The number of these feeding punctures is lowest in early summer, reaches a peak during the hot summer, and is intermediate in the fall months. If 5-6 eggs or larvae are found in one fruit, they are laid by different females. Eggs hatch within 2-3 days during summer and 18-20 in fall. When the fruit is small, the larvae may feed on the fruit stems, causing fruits to drop before maturity, but when the olives are large and almost ripe, larvae remain in the fruits and gnaw large tunnels. Larvae pass through three larval instars in 18-20 days to complete their development. Last generation larvae fall to the soil to pupate at a 2-8 cm depth. During the hot months of summer, however, they sometimes pupate in the fruits, probably because the olive fruits may provide more moisture than the soil. Adults emerge in summer 8-10 days after pupation. The duration of one generation varies from 30 to 35 days in summer. There are four generations per year.

At the beginning of the olive season and in early summer, environmental conditions favor the development of all stages of the olive fruit fly, so that each of the first two generations is completed within a month. On the other hand, the hot temperatures of late summer, and the cold temperatures and rain of fall cause the last two generations to take about 2 months each to be completed (Sharaf 1980). In Greece, adults survive up to 20-160 days at 24° C (Manicas 1974).

In Egypt, the fly has five overlapping generations during the summer and fall, depending on the prevailing temperature and humidities (Donia, El-Sawaf, and Abou-Ghadir 1971).

Literature Cited

Christenson, L. D.: Foote, R. H. Biology of fruit flies. Ann. Rev. Entomol. 5:181; 1960.

Commonwealth Institute of Entomology. Distribution maps of insect pests. Ser. A, No. 74. London, England: Commonwealth Institute of Entomology; 1957.

Donia, A. R.; El-Sawaf, S. K.; Abou-Ghadir, M. F. Number of generations and seasonal abundance of the olive fruit fly, Dacus oleae (Gmel.) and the susceptibility of different olive varieties to infestation. (Diptera: Trypetidae). Bull. Soc. Entomol. Egypte 55:206-209; 1971.

El-Sawaf, S. K.; Donia, A. R.; Abou-Ghadir, M. F. Characteristics, sex, differentiation and colour variations in the adults of the olive fruit fly, Dacus oleae (Gmel.). (Diptera: Trypetidae). Bull. Entomol. Soc. Egypte 55(64):289-295; 1972.

Hill, D. S. Dacus oleae (Gmel.). p. 393, 613. In: Agricultural Insect Pests of the Tropics and Their Control. 2d ed. New York: Cambridge University Press; 1983.

Manicas, G. P. A contribution to the biology and ecology of Dacus oleae Gmel. (Diptera - Tephritidae). Greece: Athens Agriculture College; 1974. p. 65-67. Dissertation. (In Greek; English summary.)

Neuenschwander, P.; Michelakis, S. The infestation of Dacus oleae (Gmel.) (Diptera, Tephritidae) at harvest time and its influence on yield and quality of olive oil in Crete. Z. Angew. Entomol. 86(4):420-433; 1978.

Paddock, E. L. Olive fly, Dacus oleae (Gmelin). Detection Manual (Revision). D.T. 3:14. California Department of Food and Agriculture, Division of Plant Industry, Exclusion and Detection; 1976.

Phillips, V. T. The biology and identification of trypetid larvae. (Diptera: Trypetidae). Mem. Am. Entomol. Soc. 12:24-26, 40-41, 112, plates 1, 6, 12; 1946.

Sharaf, N. S. Life history of the olive fruit fly, Dacus oleae Gmel. (Diptera: Tephritidae), and its damage to olive fruits in Tripolitania. Z. Angew. Entomol. 89(4):390-400; 1980.

Weems, H. V. Jr. Olive fruit fly (Dacus oleae (Gmelin)). (Diptera: Tephritidae). Florida Department of Agriculture, Division of Plant Industry, Entomology Circular 44; 1966.